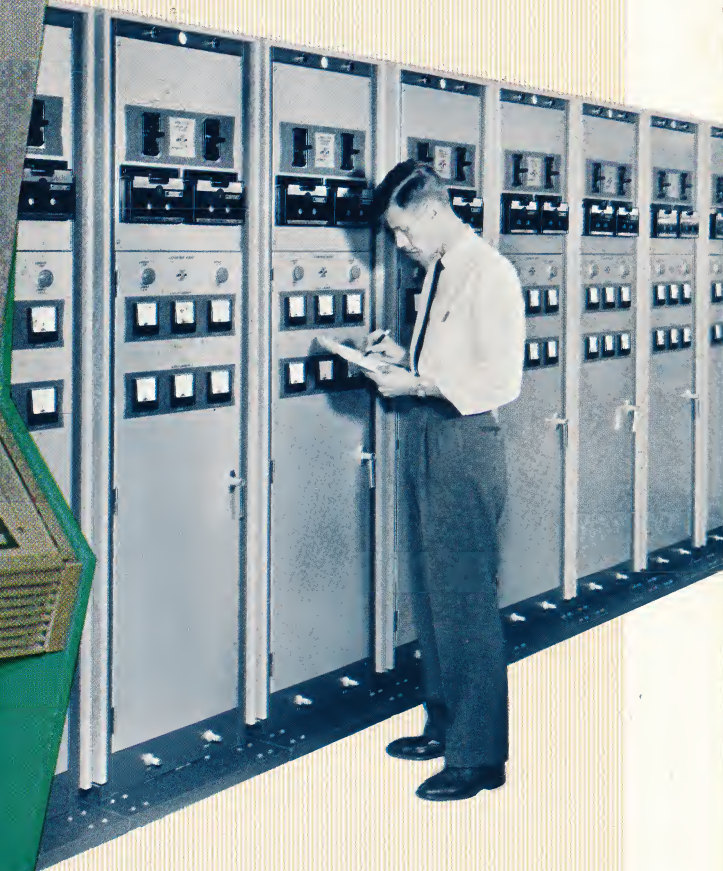


MODEL 4070

DATA-TRAK[®]

DIGITAL PROGRAMMER



R·I CONTROLS

A DIVISION OF RESEARCH, INCORPORATED
P.O. BOX 6164, MINNEAPOLIS, MINNESOTA 55424



DESCRIPTION

The R-I CONTROLS 4070 Digital DATA-TRAK Programmer is a process-control device capable of programming up to 150 channels of analog control instrumentation on a time-sharing basis (see block diagram). Each channel is sequentially supplied independent data for control of the customer's process. The time intervals are set by the program, or may be determined by manually-operated switch insertions. A 24-hour digital clock provides the real-time base.

The program-storage medium is 8-level punched tape, standard throughout the computer industry. A compatible tape preparation station (see opposite page), the TP4070, is utilized to prepare the program. The program tape can also be prepared by almost any commercial computer.

The 4070 provides broad flexibility of operation; fast milli-second data update, program holds of any desired duration, automatic recycling of a selected block of channels, and provisions for manual search and manual update data.

The data word for the controlled variable contains ten binary bits allowing 0.1% accuracy in output-potentiometer value. The solid-state digital clock provides time-base resolution to 0.1 seconds. Data supplied to each channel is held in a separate D/A converter-register until updated, and is available at the output as a digital potentiometer that is completely isolated from ground.

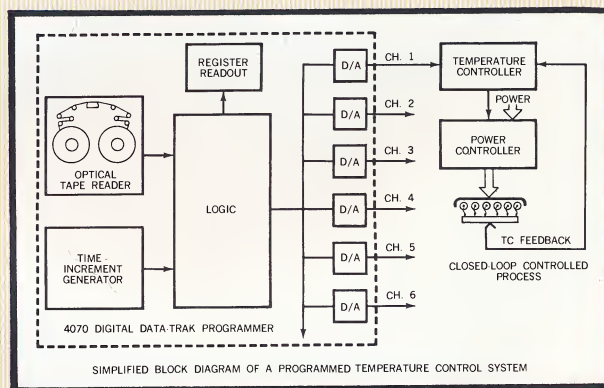
MODEL 4070

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FEATURES

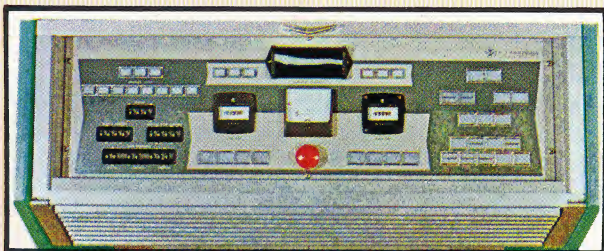
- Programs up to 150 channels simultaneously.
- Output channels isolated from ground.
- Digital-potentiometer output for each channel.
- 3 milli-second/channel scan rate.
- Programmable hold.
- Provisions for manual search, data input, and program hold.
- Four separate error indications with operator control-option.
- Auto recycle over selectable program segment for predetermined number of cycles.
- Preset stop at any predetermined block.
- Numerical display of hold time, run time, and register contents.
- Controls protected behind glass doors.



OPERATION

The basic philosophy in designing the 4070 was to create a unit capable of multi-loop control; easily programmable, simple to operate, and highly reliable during long periods of operation.

The program is implemented in information "blocks", each block having an individual address and containing from one to any desired number of channels of process-variable update information or program-hold-time duration. In the execution of the program, a block is read at the beginning of each time-interval. The length of time-interval is manually inserted on decimal indicating switches located on the control panel. A program-hold command inhibits the program for the length of time programmed on the tape.



Decimal-indicating controls for manual insertion of recycle addresses are provided on the control panel. These allow automatic repeated cycling of a particular section of the tape for a selected number of cycles. Also provided on the panel are manual controls for these functions.

Four-digit decimal readouts for displaying the contents of the data in the block- or channel-address registers, as well as decimal indicators for Hold and Run time, are included on the control panel.

The control panel is protected by a glass door to prevent accidental or unwanted operation of the control switches.

ERROR AND FAIL-SAFE PROTECTION

Error in the transfer of data from the tape, and tape-programming errors, are immediately identified on four separate error-indicating lights on the control panel. Each provides push-button controls for operator options with respect to program continuation. Failure of the D/A converter power supply causes all of the analog control outputs to drop to zero. A large EMERGENCY STOP switch, which removes all power from the system, is located in a prominent center position on the control panel.

ELECTRONICS

All logic and data circuits of the 4070 and TP4070 are completely solid-state, integrated-silicon devices of modular plug-in construction. The circuits are mounted on interchangeable glass-epoxy printed circuit cards and utilize extremely reliable high-density connectors. Test points are brought out on all circuit outputs for signal monitoring and trouble shooting, providing simplified techniques for checkout and maintenance.



DESCRIPTION

The R-I CONTROLS TP4070 Tape Preparation Station contains a 15-key serial-entry electrical keyboard, a desk containing the logic and power supply chassis, and an 8-level tape punch. Optional printout may be provided on a standard printer.

OPERATION

Numerical information representing channel-address and command data is inserted through the keyboard which is operated similar to a standard serial adding

MODEL TP 4070

DATA-TRAK[®]

TAPE PREPARATION STATION

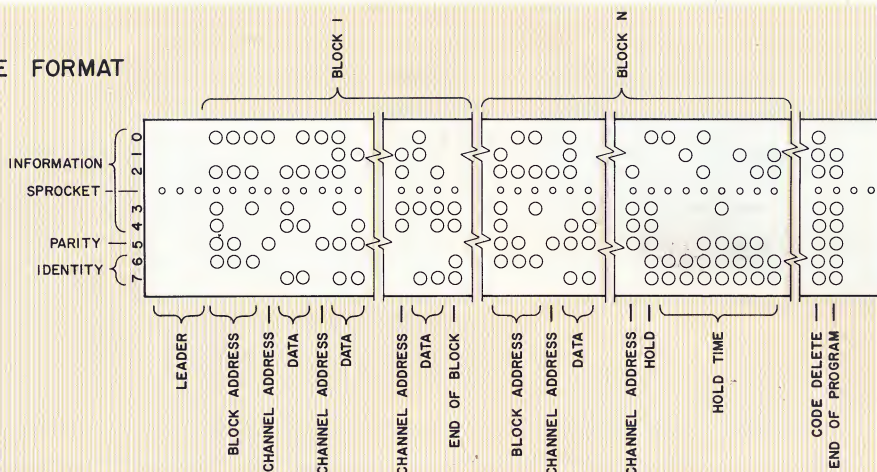
FEATURES

- Converts keyboard information into proper tape format.
- Prevents entry of new information until previous information has been checked for errors.
- Parity-error indicator.
- Missed-frame error indicator.
- Ascending-order error indicator.
- Keyboard locks until error is cleared.
- Operates off-line.

machine. It is converted to binary form and punched on the tape in proper format. Error detection and identification circuits continually monitor input data. Error-indicating lights signify the presence of an error, inhibiting program preparations until the operator has corrected the error. The TP4070 can be operated off-line.

2300 feet of paper or polyester base tape can be contained on the large 10" reels of the system. This represents over 90,000 data-variable points.

TAPE FORMAT



SPECIFICATIONS

4070 DIGITAL PROGRAMMER

General

TAPE READER - Optical, Bi-Directional
SCAN RATE - 3 Milli-seconds/Channel
TAPE SPEED - 1000 Frames/Second, Maximum
TAPE LENGTH - 2300 Feet, 2 Mil-Polyester Film
OUTPUT - Digital Potentiometer (1 per Channel)
OUTPUT RESISTANCE/CHANNEL VALUES - 1023
 Ohms (Standard) isolated from ground,
 can be shunted to other values
RESOLUTION - 0.1%
CHANNEL CAPACITY - 30 Standard,
 150 Maximum

DATA POINTS - 90,000 per 2300 ft. Tape
DIGITAL CLOCK - (Time-Increment Generator)
 24-Hour, BCD, Solid-State
 0.1 second accuracy
REGISTER READOUTS - 4-Digit Decimal
DECIMAL INDICATORS - Hold-Time, Run-Time
OVERALL HEIGHT 76 Inches
OVERALL WIDTH 36 Inches
OVERALL DEPTH 34 inches
POWER REQUIREMENTS - 115 VAC, 60 Hz,
 600 WATTS

Electronics

D/A CONVERTERS - Plug-In Cards, Solid-State,
 4" x 12"

LOGIC MODULES - Plug-In Cards, Integrated
 Circuits, Silicon, 3" x 3"

TP 4070 TAPE-PREPARATION STATION

TAPE PUNCH - 8-Level, Motor-Driven
KEYBOARD - Serial-Entry, 15 Keys
 (Plus 4 Error Lights)
LOGIC MODULES - Plug-In Cards, Integrated
 Circuits, Silicon, 3" x 3"

TAPE MATERIAL - Polyester-Film or Paper
REEL SIZE - 10-Inch
OVERALL HEIGHT 50 Inches
OVERALL WIDTH 44 Inches
OVERALL DEPTH 28 Inches

RELATED EQUIPMENT

R-I CONTROLS designs and manufacturers complete temperature, power and process-control equipment and systems. For those who are building or implementing their own facilities, the following related modular units are offered:

COMBINED TEMPERATURE-POWER CONTROLLERS — High-performance THERMAC* Solid State Controllers. (Request Bulletin 501)

POWER REGULATORS — Ignitron, Thyatron and Solid-State Power Regulators. (Request Bulletin 503.2)

THERMOCOUPLE REFERENCE-JUNCTION BOX — Accommodates up to 50 thermocouple pairs of any type (or combination of types) in one convenient unit. (Request Bulletin 506.1)

RADIANT HEATERS, CUSTOM-DESIGN FURNACES — Fast response, high flux-density reflector modules using tungsten-filament tubular quartz lamps. (Request Bulletin 504)

RESISTANCE HEATING SYSTEMS — Step-down Transformers for direct heating and brazing. (Request Bulletin 505)

SOLAR HEAT SIMULATION REFLECTOR ASSEMBLIES — Infrared lamp source. (Request Bulletin 504.3)

*Trade Marks of Research, Incorporated, Minneapolis, Minn.



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